APPENDIX C: MANAGEMENT INDICATOR SPECIES

Introduction

Management Indicator Species

Management indicator species (MIS) are species selected to serve strong roles as indicators of major management activities' effects or of ecosystem change. These species are selected to act as indicators of particular activities or habitats.

Forest Plan

The forest plan and amendment 3 to the forest plan (USDA Forest Service, WRNF 2002a, 2006) establishes the management indicator species and the protocols for measurement and study on the White River National Forest. The MIS are analyzed below to address potential impacts on wildlife from implementing the proposed action. A thorough viability assessment of species found on the White River National Forest was completed as a portion of the forest plan.

Forest plan objective and strategy for MIS:

Objective 1b - Provide ecological conditions to sustain viable populations of native and desired nonnative species and to achieve objectives for Management Indicator Species (MIS) and focal species

Strategy 1b.4 - Within 15 years, demonstrate positive trends in habitat availability, habitat quality, or other factors affecting sensitive species and Management Indicator Species.

Assumptions listed under the BA section (appendix A) apply to the MIS section as well.

Terrestrial Vertebrates MIS

Travel-management-related impacts on wildlife vary with the volume, timing, and type of travel; the species of wildlife in the area; the habitats involved; time of day or season of year; and a myriad of other factors. Several recent literature reviews of recreation impacts on wildlife have been completed. These include:

- Effects of Winter Recreation on Wildlife of the Greater Yellowstone Area: A Literature Review and Assessment (Olliff et al. 1999);
- Effects of recreation on Rocky Mountain Wildlife Habitat (Joslin and Youmans 1999);
- The Environmental Impacts of Recreation: a Bibliography (Anon. 1999);
- Forest Roads: A Synthesis of Scientific Information (USDA Forest Service 2000c);
- Wildlife and recreationists: Coexistence through management and research (Knight and Gutzwiller 1995);
- Effects of off-road recreation on deer and elk (Wisdom et al. 2004); and

- The Effects of Highways on Elk (*Cervis elaphus*) Habitat in the Western United States and Proposed Mitigation Approaches (Ruediger et al 2006)

These exhaustive reviews of past studies contain a wealth of information concerning the impacts on wildlife of vehicular and other types of recreation use. Many of the reports cite the effects of roads on habitat fragmentation; isolation of rare and unique habitats such as fens, bogs or alpine areas; direct effects such as collisions with animals and physical destruction of habitats; abandonment of habitats; and physiological stress reactions related to the impacts of travel management. The widespread, detrimental impacts of human disturbance on wildlife are well-documented throughout these reports. See the above documents for specific documentation of potential impacts.

The terrestrial vertebrate management indicator species and habitat types identified from the forest plan are:

- Cave bats
- Brewer's sparrow
- American pipit
- Virginia's warbler
- Elk

Cave Bats

Cave bats were chosen as a management indicator species for the forest plan revision to answer the question, "Are caves being managed so that bat species will continue to use the caves, and maintain populations in the areas adjacent to the caves?"

Management Issues

The primary management issue identified concerning bats is unregulated recreation use of natural caves used by bats for various life history requirements (USDA Forest Service/White River National Forest 2002a). Cave bat habitat on the White River National Forest is generally confined to the caves found within the karst topography areas of the forest and the abandoned mines left from early mineral exploration.

Some bats do roost in trees, rock crevices, and other natural features. It is not feasible to monitor bat use of these widely diverse areas, and these habitats are not the focus of the identified management issue.

Some historical data exists for bats on the White River National Forest. Past bat surveys were designed to produce presence/absence information and did not provide specific population data for any of the species surveyed. Information on approximate numbers of bats has been obtained during some of these surveys. The most complete of these surveys was a 2002 survey (Siemers 2002) of 99 caves in the state. This survey documented several caves on or near the White River National Forest occupied by bats. Ten caves either on the forest, or immediately adjacent to National Forest System lands, contained from 1 to at least 112 bats (the most found in any cave in the state during this survey) with up to five species. The cave with the highest number of bats is one of the better known caves in the area, access to which is managed by the local grotto group with a locked gate. Because of the sensitivity of bats to disturbances, the actual site locations and identification of species are not divulged in this report. Access to known caves on the forest varies from being near collector roads to requiring lengthy hikes over difficult

terrain with no roads or trails. The majority of the identified caves on the forest are found in steep, remote canyons, generally with difficult access.

A data spreadsheet has been developed documenting all of the known information concerning cave surveys and bats across the Forest. This information documents bat use of 9 caves on the Forest with one additional cave used by bats immediately off NFS lands. Some of these caves have had multiple formal and/or informal surveys conducted over the past 20 years, and various levels of trend information are available for several of these bat populations. Declining bat populations have been documented in at least one cave on the Forest. Other cave inventories indicate stable to possibly increasing numbers. Cave and bat location information is considered to be sensitive information due to the fragile nature of cave ecosystems. This information is kept on file at the Supervisor's Office in Glenwood Springs, but is not subject to public disclosure.

Most identified cave bat use on the forest is associated with the caves occurring on the White River Plateau and the area south and east of Glenwood Springs. Not all caves have been mapped across the forest, so karst topography was used to identify potential bat habitat. Karst topography in these areas provides the necessary features for the development of caves necessary for many species of roosting bats. Only a small fraction of the karst topography actually supports caves that would be suitable as roosting habitat for bats; the vast majority of the lands included in this analysis does not provide bat habitat.

Potential Impacts

This analysis is a very conservative evaluation of potential impacts on bats. Bat habitat will not be modified directly under any of the alternatives being analyzed in this document. The change in access provided by changes in the travel management across the forest retains some level of access to caves, either known or unknown at this time. No new roads or trails are being constructed under any of the alternatives; furthermore, because decommissioning and rehabilitation of roads and trails is proposed in alternatives F and G, overall access is expected to be reduced in those alternatives.

The analysis for bats (table MIS-1) included the following criteria:

- Miles of authorized travelway, by use type, within 2 miles of karst topography;
- Postulated increases in access, to provide the potential for increased recreation use of any caves that may be accessed by those travelways.

Table MIS-1. Travelway densities by alternative for lands within 2 miles of karst topography on the White River National Forest

Type of use	Density (miles per square mile)		
	Alternative A	Alternative F	Alternative G
Motorized	0.69	0.69	0.58
Mechanized	0.22	0.22	0.17
Motorized/mechanized	0.91	0.91	0.75
Foot/horse	0.34	0.34	0.37
Total	1.26	1.26	1.12
Scheduled for decommission (reduction in density)	0.00	0.28	0.40

Approximately 953 square miles of potential habitat were analyzed for this species.

Karst topography on the White River National Forest covers a much broader area than the known caves supporting cave bat populations. Most roads and trails within this analysis area do not affect access to caves, because only a limited number of caves occur within

the large area under analysis. However, in some areas road and trail use may result in maintaining existing levels of recreation use of any caves that exist near these travelways. Because the locations of all caves on the forest are not known or mapped, it is not possible to quantify which specific roads and trails may affect these undiscovered cave habitats. For cave bats, alternative F is identical to alternative A. Alternative G reduces motorized and mechanized access while slightly increases foot/horse access. Both alternatives F and G would result in reduced road/trail densities across the forest because of decommissioning and rehabilitation of roads and trails.

The forest plan contains direction that results in additional protection for cave resources above those that existed prior to the revision (USDA Forest Service/White River National Forest 2002a). This direction includes cave standards 1 through 3:

- Cave standard 1–"Manage natural surface drainage and vegetation that may affect known caves or cave resources to protect cave micro-environments;"
- Cave standard 2–Management activities that may affect known caves will be designed to protect cave ecosystems;"
- Cave standard 3–"Identified significant caves will be withdrawn from mineral entry;" and wildlife standards 2 and 3:
- Wildlife standard 2–"Restrict actions within 500 feet of cave and mine bat roosts to those that will not negatively alter the vegetative and structural characteristics of roosts or impede the movements of bats;"
- Wildlife standard 3–"Restrict the release of the location of bat roosts to administrative purposes only in order to minimize disturbance to roosting bats."

Winter

Winter motorized uses would be reduced in all alternatives over the existing situation. Reduced winter use should reduce potential impacts to hibernating cave bats under all alternatives (table MIS-2).

Table MIS-2. Winter travelway miles and acres by alternative for lands within 2 miles of karst topography on the White River National Forest

Type of use	Alternative A	Alternative F	Alternative G
Winter open motorized (acres)	266,228	266,228	240,262
Winter restricted motorized (miles)	113,153	113,153	139,118
Winter Motorized Prohibited	216,742	216,742	216,742

955 square miles of potential habitat were analyzed for these bat species.

Alternative A and F would have the same number of acres of authorized motorized use areas during winter. Alternative G reduces the number of acres of open motorized and increases the number of motorized restricted acres. Fewer acres of open motorized areas are felt to equate to fewer potential of impacts on cave resources from recreation use.

Determination

None of the alternatives are expected to change either population or habitat trends for cave bats at the forest level for the following reasons:

- The lack of direct habitat alterations from the proposed action under all alternatives;
- The protection direction included in the forest plan for this group of species;

- The limited changes in overall miles of travelways for alternatives F and G (both would reduce existing mileage over the current situation on the forest) would have minimal effect on cave access;
- The overall reduction in road and trail densities for all alternatives over the existing situation due to future decommissioning efforts would reduce overall access;
- Any indirect effects of reduced access that results from the decommissioning of travelways would be too minor to allow meaningful analysis of either habitat or population trends;
- The potential of recreational disturbance impacts associated with any of the alternatives is expected to decrease slightly because of the decrease in overall road and trail density for all alternatives compared to existing densities.

Cave bat habitat would not be directly affected under any of the alternatives in the travel management plan; forest plan standards provide protections to cave resources; and there is a limited amount of potential for detrimental impacts on populations or habitats under any of the alternatives because all action alternatives would result in overall reduced densities of road and trails within the analysis area. Based on the limited potential for direct, indirect, or cumulative effects, there is not likely to be measurable effects on this group of species at the forest level from any of the proposed alternatives. Road and trail decommissioning under all action alternatives could lead to reduced access, resulting in minor long-term beneficial effects for cave bats on the forest. Any such increase is not expected to be measurable. All alternatives have been evaluated and none would create negative trends that would affect achievement of forest plan management indicator species objectives or create viability concerns for any of the species in this group. Bat populations will continue to be monitored across the forest using the protocol developed as a part of the forest plan. Some species of bats are on the regional forester's sensitive species list and are discussed in the BE. These species will continue to be monitored under Regional policies concerning sensitive species.

Brewer's Sparrow

Brewer's sparrow (*Spizella breweri*) were selected as forest management indicator species to answer the question, "Is sagebrush habitat being managed adequately to provide the quality and quantity of habitat for species dependent upon or strongly associated with sagebrush?" This species is a sensitive species on the White River National Forest and is discussed in more detail in the BE (appendix B).

Management Issues

The primary concerns for sagebrush-dependent species on the White River National Forest include the limited amount of sagebrush habitat on the forest, the vulnerability of the habitat to negative impacts from vegetation management activities, and the decreasing population trends for species associated with sagebrush throughout its range in western states (USDA Forest Service/White River National Forest 2002a). Brewer's sparrows have been documented in suitable sagebrush habitats across much of the forest. This species is used as an indicator of potential effects of management activities on sagebrush habitats across the forest.

Analysis of the RMBO and White River National Forest transect information indicates that this MIS showed no evidence of population declines from 1999-2007, either from the Ecological Section data or from the MCB data (Blakesley 2008). Populations appeared to

be stable (no trend evident) for all this species state-wide. There was evidence for an increasing log-linear trend in Brewer's Sparrow population size between 1999 and 2007 in the North-Central Highlands and Northern Parks and Ranges Ecological Sections (RMBO 2008). This analysis indicates that the trend for this species on the White River National Forest is stable to increasing at this time.

Potential Impacts

Sagebrush habitats would not be directly affected by any of the decisions proposed under this action; however, some sagebrush areas may benefit in the long term from road and trail decommissioning planned under the action alternatives, which propose decommissioning road across the forest including in sagebrush habitats. This decommissioning would result in those areas eventually reestablishing into native vegetation with the added benefit of less disturbance from human uses.

The primary impacts identified from any proposed alternatives include direct impacts associated with vehicle collisions causing death or injury to individuals and indirect impacts associated with harassment due to vehicles and human use of habitats that are used by Brewer's sparrow. Some potential for road kills exists across the forest; however, the relatively low speeds of vehicles using most forest roads lessens the potential for impacts, because most individuals would move out of harm's way before being hit. Indirect harassment of individuals may occur but the literature does not support harassment as being a major risk issue for this species. The literature does not indicate concerns for disturbance effects from motorized use of roads or trails in sagebrush areas for Brewer's sparrow. Therefore, disturbance effects from the use of roads or trails are expected to be minimal for Brewer's sparrow under all alternatives.

The White River National Forest has established transects for Brewer's sparrow in suitable sagebrush habitats on the forest. Polygons of habitat for transect placement were identified in 2004; transects were established on the Blanco, Eagle, Holy Cross, Rifle, and Dillon districts in the 2005 field season. Point counts have annually been conducted beginning in 2005 between 22 May and 11 June to establish baseline population estimates. Additionally, the Rocky Mountain Bird Observatory has been collecting state-wide transect count information for this species over the past 10 year period. Some of this transect information is directly applicable to the White River National Forest.

The analysis for Brewer sparrow is shown in table MIS-3. This analysis included all of the roads and trails located within areas mapped as sagebrush in the White River vegetation GIS coverage.

Table MIS-3. Travelway densities by alternative for lands within the sagebrush communities on the White River National Forest

	Density (miles/square mile)		
Type of Use	**Alternative A**	**Alternative F**	**Alternative G**
Motorized	1.64	1.64	1.28
Mechanized	0.27	0.27	0.18
Mot/mech	1.91	1.91	1.47
Foot/horse	0.29	0.29	0.38
Total	2.20	2.20	1.85
Scheduled for Decommission (reduction in density)	0.00	0.49	0.75

Approximately 73 square miles of potential habitat were analyzed for these species.

Within Brewer's sparrow habitat, alternatives A and F provide the same authorized uses. Alternative G reduces motorized use by 26 miles (21%) and mechanized by 6 miles (35%). Foot and horse access is increased by 6 miles on current, established routes. Planned decommissioning of travelways would reduce open travelway density in alternatives F and G when compared to the current, existing situation.

Sagebrush habitats would not be directly affected by any of the decisions proposed under this draft environmental impact statement; however, some sagebrush areas may benefit in the long term from road and trail decommissioning planned under some alternatives. This decommissioning would result in the eventual reestablishment of those areas into native vegetation with the added benefit of fewer disturbances from human uses. The literature does not indicate concerns about disturbance effects from motorized use of roads or trails in sagebrush areas for Brewer's sparrow. Disturbance effects from the use of roads or trails are expected to be minimal for this species under all alternatives.

The forest plan contains direction that results in additional protection for sagebrush-dependent wildlife resources above those that existed prior to the revision effort. This direction includes the rangeland ecosystem management standards and guidelines covering general livestock management (USDA Forest Service/White River National Forest 2002a, page 2-10 to 2-11); and sage-grouse and Brewer's sparrow standards and guidelines (USDA Forest Service/White River National Forest 2002a, page 2-25 to 2-26). These standards and guidelines all are specifically designed to maintain sagebrush habitats in a condition that will provide suitable habitat for these species.

Winter

Brewer's sparrows are migratory and will be gone from the forest during the period of time winter travel is occurring. Winter motorized travel may affect sagebrush areas through impacts associated with direct crushing or compacting of snow. These impacts are expected to be minor across the existing range of sagebrush on the Forest. These minor impacts may result in immeasurable impacts to Brewer's sparrow from winter travel management alternatives.

Determination

Under all alternatives, the proposed action is not expected to change either population or habitat trends for either of this species at the forest level for the following reasons:

- The lack of direct detrimental habitat alterations from the proposed action;
- The protection direction included in the forest plan for the habitat of this species;
- The low likelihood of increased recreational disturbance impacts associated with any of the alternatives;
- The limited changes in the overall miles of travelways for all action alternatives;
- The overall reduction in road and trail densities for all alternatives over the existing situation because of future decommissioning efforts; any direct habitat enhancement that results from the decommissioning of travelways would be too minor to allow meaningful analysis of either habitat or population trends.

Sagebrush habitat would not be directly adversely affected under any of the alternatives in the travel management plan; forest plan standards provide protections to sagebrush resources; and there is limited potential for direct impacts to individuals or population due to limited scope of the proposed action. Only limited indirect effects due to disturbances associated with human use of roads and trails are expected to result from the

implementation of any of the alternatives. No cumulative impacts have been identified that would affect the populations or habitat of these species on National Forest System lands. Based on the limited potential for direct, indirect, or cumulative effects, there are not likely to be measurable effects to this species at the forest level from any of the proposed alternatives. Road and trail decommissioning and rehabilitation under all action alternatives would lead to reduced access resulting in minor long-term beneficial effects for sagebrush-dependent species on the forest. Any such increase is not expected to be measurable. All alternatives have been evaluated and none would create negative trends that would affect achievement of forest plan management indicator species objectives or create viability concerns. Populations of Brewer's sparrow will continue to be monitored across the forest using the protocols developed as a part of the forest plan.

American pipit

American pipit (*Eremophilia alpestris*) was selected for monitoring to answer the question, "Is the alpine grassland habitat being managed to provide habitat for those species dependent or strongly associated with alpine grassland habitats?"

Management Issues and Potential Impacts

The primary habitats for American pipit include the alpine grassland areas as well as grasslands in the lower portions of the forest. The primary risk factors affecting alpine grassland communities on the White River National Forest have been identified as recreation and livestock management in alpine areas. These areas are very sensitive to disturbances that alter vegetation cover, because the soils are very unstable and have low fertility, and because the vegetation is slow-growing (USDA Forest Service/White River National Forest 2002a).

Analysis of the White River National Forest transect data and the RMBO data indicates that this MIS showed no evidence of population declines from 1999-2007, either from the Ecological Section data or from the MCB data. Populations appeared to be stable (no trend evident) for this species state-wide and in the Northern Parks and Ranges Ecological Section (Blakesley 2008). This analysis indicates that the trend for this species on the White River National Forest is stable at this time.

Approximately 126,000 acres (197 square miles) of alpine habitat on the White River National Forest supports grassland communities that may be suitable habitat for pipit. Most of these areas are located within designated wilderness areas across the forest. This information was developed from the riparian-non-forest GIS coverage at the forest level. The analysis for this species (table MIS-4) included the number of miles of roads or trails within grassland communities, by use types, by alternative, within the alpine land type association.

Table MIS-4. Travelway densities by alternative for lands within the alpine grassland communities on the White River National Forest

Type of use	Density (miles per square mile)		
	Alternative A	Alternative F	Alternative G
Motorized	0.18	0.18	0.18
Mechanized	0.11	0.11	0.10
Motorized/mechanized	0.29	0.29	0.27
Foot/horse	0.41	0.41	0.46
Total	0.70	0.70	0.73
Scheduled for decommission (reduction in density)	0.00	0.19	0.16

Approximately 197 square miles of potential habitat were analyzed for this species.

For alpine grassland communities that may support pipit populations, none of the alternatives would increase motorized road and trail density over alternative A. Alternative G would add a total of approximately 10 miles of foot and horse travelways (0.06 miles per square mile) over alternative A. Planned decommissioning and rehabilitation of travelways would reduce open travelway density in all action alternatives when compared to the current, existing situation.

The forest plan contains direction that results in additional protection for alpine communities above those that existed prior to the revision effort. This direction includes rangeland ecosystem management standards and guidelines covering general livestock management (USDA Forest Service/White River National Forest 2002a, pages 2-10, 2-11); and alpine standards and guidelines (USDA Forest Service/White River National Forest 2002a, page 2-8 as amended). These standards and guidelines are all specifically designed to maintain alpine ecosystems.

Winter

Pipits are migratory and will be absent from the forest when winter travel is occurring. No direct impacts on their populations are expected from winter travel in any of the alternatives. There is a possibility of some effects to alpine ecosystems from motorized winter travel and from the continued use of the winter sports resorts found on the Forest. These impacts are expected to be minor and not measurable at the scale of the Forest. There would be no measurable impacts to pipit or its habitats from any of the winter travel management alternatives.

Determination

The primary impacts identified from any of the proposed alternatives include direct impacts associated with vehicle collisions causing death or injury to individuals and indirect impacts associated with disturbance and harassment due to vehicles and human use of habitats used by this species. Some potential for road kills exists across the forest; however, the low density of motorized routes coupled with the relatively low speeds of vehicles using most forest roads in pipit habitat lessens the potential for impacts because most individuals would move out of harm's way before being hit. Indirect disturbance and harassment of individuals may occur; however, the literature does not support this being a major risk factor for this species. Therefore, disturbance effects from the use of roads or trails are expected to be minimal for pipit under all alternatives.

The proposed action is not expected to change either population or habitat trends for these species at the forest level for the following reasons:

- The lack of direct detrimental habitat alterations from the proposed action;
- The protection direction included in the forest plan for the alpine habitats used by this species;
- The reduced likelihood of recreational disturbance impacts associated with any of the alternatives because of reduced road and trail densities;
- The overall reduction in road/trail densities for all alternatives over the existing situation because of future decommissioning efforts; any direct habitat enhancement that results from the decommissioning of travelways will be long-term and too minor to allow meaningful analysis of either habitat or population trends at the forest level;
- None of the alternatives results in any changes to livestock management across the forest; this potential risk factor will not be changed or affected by the actions under this draft environmental impact statement.

Alpine grassland ecosystems would not be directly adversely affected under any of the alternatives in the travel management plan; forest plan standards provide protections to alpine ecosystems; and there is limited potential for impacts to alpine grassland dependent species due to the limited scope of the proposed action. No cumulative impacts have been identified that would affect these habitats on National Forest System lands. Based on the limited potential for direct, indirect, or cumulative effects, there are not likely to be measurable effects on alpine grassland communities at the forest level from any of the proposed alternatives. Road and trail decommissioning rehabilitation under all action alternatives should lead to reduced access resulting in minor long-term beneficial effects for alpine grassland-dependent species on the forest. Any such increase is not expected to be measurable. All alternatives have been evaluated and none would create negative trends that would affect achievement of forest plan management indicator species objectives or create viability concerns. This species will continue to be monitored across the forest using the protocol developed as a part of the forest plan.

Virginia's Warbler

Virginia's warbler (Vermivora virginiae) was selected as a forest management indicator species to answer the question, "Does forest management maintain populations of species dependent on dense shrub habitat dispersed throughout the shrub cover types?"

Management Issues and Potential Impacts

The major risk factors identified for this species include prescribed fire that decreases the density of shrub habitats. Virginia's warbler is a species closely associated with dense shrub stands. On the White River National Forest, these birds are found in many shrubland types from approximately 6,000 to 9,000 feet.

Analysis of the White River National Forest transect data and the RMBO transect data for this MIS showed no evidence of population declines from 1999-2007, either from the Ecological Section data or from the MCB data (Blakesley 2008). Populations appeared to be stable (no trend evident) for this species state-wide and there was evidence for an increasing linear trend in Virginia's Warbler population size between 1999 and 2007 in the Northern Parks and Ranges Ecological Section including the White River National Forest (Blakesley 2008). This analysis indicates that the trend for this species is stable to increasing on the White River National Forest at this time.

Approximately 278,000 acres (434 square miles) of shrubland habitats occur on the White River National Forest that may be suitable habitat for warbler. Most of these areas are located across the lower elevations of the forest. The analysis for this species included the number of miles of roads or trails within shrubland communities, by use types, by alternative (table MIS-5).

Table MIS-5. Travelway densities by alternative for lands within the shrubland communities on the White River National Forest

Shrublands	Density (miles/square mile)		
Type of Use	Alternative A	Alternative F	Alternative G
Motorized	0.99	0.99	0.85
Mechanized	0.27	0.27	0.18
Mot/mech	1.26	1.26	1.03
Foot/horse	0.33	0.33	0.41
Total	1.59	1.59	1.44
Scheduled for Decommission (reduction in density)	0.58	0.33	0.44

Approximately 434 square miles of potential habitat were analyzed for these species.

For shrubland communities that would support warbler populations, alternative A and F allow the same authorized uses. Alternative G decreases motorized and mechanized routes while increasing foot and horse access. Planned decommissioning and rehabilitation of travelways would reduce open travelway density in all the alternatives when compared to the current, existing situation.

Winter

Warblers are migratory and will be gone from the forest when winter travel is occurring. A large portion of the shrubland habitat on the White River National Forest occurs within management prescriptions (5.41 and 5.43) that afford some level of protection from winter uses that might affect this species. Additionally, these habitats often occur on steep terrain that also provides some protection from motorized impacts. No measurable impacts on Virginia's warbler habitats are expected from winter travel. There would be no direct impacts to warblers from any of the winter travel management alternatives.

Determination

The proposed action is not expected to change warbler population or habitat trends for this species at the forest level for the following reasons:

- The lack of direct detrimental habitat alterations from the proposed action;
- The low likelihood of increased recreational disturbance impacts associated with any of the alternatives;
- The limited changes in the overall miles of travelways for all alternatives;
- The overall reduction in road and trail densities for the action alternatives over the existing situation because of future decommissioning efforts; any direct habitat enhancement that results from the decommissioning of travelways would be too minor to allow meaningful analysis of either habitat or population trends.

There is no current literature that indicates that warblers are significantly disturbed by motorized, mechanized, or foot/horse use of existing roads or trails. Shrubland ecosystems would not be directly adversely affected under any of the alternatives in the travel management plan. There would be no disturbance-related impacts, and there is limited potential for impacts on shrubland-dependent species because of the limited scope of the proposed action. No cumulative impacts associated with this proposed action have been identified that would affect these habitats or this species on National Forest System lands. Based on the limited potential for direct, indirect, or cumulative effects there is not likely to be measurable detrimental effects on warbler habitats at the forest level from any of the proposed alternatives. All the alternatives have been evaluated and none would create negative trends that would affect achievement of forest plan management indicator species objectives or create viability concerns. There may be a slight, long-term beneficial effect on overall habitat for this species due to road and trail decommissioning. Any beneficial effect would be too minor to be measurable at the forest level. This species will continue to be monitored across the forest using the protocol developed as a part of the forest plan.

Elk

The American elk (*Cervus elaphus)* was selected as a White River National Forest management indicator species to answer the monitoring question "Does forest motorized and non-motorized travel and recreation management result in effective use of habitat by large wild ungulates?"

The major risk factors identified for this species include the reduction in forage and cover habitats and disturbance from human uses, especially in calving and wintering areas. There would be changes in motorized, mechanized, and non-motorized travel associated with the different alternatives in this analysis.

Distribution and Abundance

Elk occur throughout the mountainous regions of the western United States and Canada. Elk populations throughout its range were very low in the early 1900s.

Elk are habitat generalists and their populations respond to climate-induced factors (such as forage availability and quality). Hunter harvest also can have a strong influence on populations, especially when security habitat (dense vegetation providing visual cover) is poorly distributed or scarce.

Hunter harvest currently is used to maintain populations within objectives set by the Colorado Division of Wildlife (CDOW). Where elk populations remain high or exceed population objectives set by the division, the cause often is a failure in providing secure habitat on public lands where hunter harvest can be used to maintain populations within objectives. Hunter harvest on private lands typically is more limited, because either access fees or landowner preferences restrict the number of hunters and the gender of elk harvested.

Region-wide, most elk populations are at or above herd management objectives, which are established within an estimated carrying capacity and balanced with hunter demand and other resource objectives, although data in this objective-setting process are typically limited and many assumptions are made. Mortality in elk populations in Colorado is mainly due to predation on calves, hunting, and winter starvation (Fitzgerald et al. 1994).

Habitat Associations

Elk habitat occurs throughout the mountainous regions of western North America. The habitat on the White River National Forest includes all the major vegetation types and most of the minor types found in the Southern Rocky Mountains. The White River National Forest provides most of the summer range for the herds in the general area. Certain areas in the extreme lower elevations of the White River National Forest are used as winter or transitional range but the vast majority of the winter range occurs off the White River National Forest. Winter range is considered to be the most limiting seasonal range for most elk populations on the forest (CDOW 2002). Approximately 10 percent of the winter range is found on National Forest System lands for the populations of elk that spend the summer on the White River National Forest. The remaining 90 percent is located on either BLM lands or private lands surrounding the forest (CDOW 2002).

Forest Plan Goals, Objectives, Standards, and Guidelines for Elk Management

Objective 1b. Provide ecological conditions to sustain viable populations of native and desired nonnative species and to achieve objectives for management indicator species and focal species.

Strategy 1b.4. Within 15 years, demonstrate positive trends in habitat availability, habitat quality, or other factors affecting sensitive species and management indicator species.

Management indicator species objective for elk. Manage motorized and non-motorized travel and recreation management to maintain effective use of habitat by large wild ungulates.

Wildlife Standard 1. Seasonal restrictions will be applied to reduce disturbance in key wildlife habitats.

Wildlife Standard 7. Vegetation treatments and new roads and trails will not reduce the elk habitat effectiveness index below 0.40 by data analysis unit (DAU), or further reduce effective habitat in DAUs that are already at or below 0.40 on National Forest System lands.

Infrastructure Standard 2. Close and rehabilitate temporary roads when no longer needed for project purposes.

Infrastructure Guideline 1. Consider seasonal restrictions for travelways if: use causes unacceptable damage to soil and water resources due to weather or seasonal conditions; use causes unacceptable wildlife conflict or habitat degradation; use results in unsafe conditions due to weather conditions; the area accessed has a seasonal need for protection or non-use; or it is necessary to resolve conflicts between users.

Infrastructure Guideline 4. Consider road decommissioning: when there is no longer any need for the road; when environmental degradation is occurring; when the cost of continued maintenance exceeds available funding; when alternative routes may be available; and to protect natural or cultural resources.

Population Trends

The CDOW has specific elk management goals and objectives developed in cooperation with landowners, the public, and federal land management agencies. These plans help guide the state's direction in the management of elk on the various data analysis units (DAUs) (figure MIS-1); they also provide data for recommending specific hunting

regulations to meet state herd objectives. Periodically these plans are updated to cover land management changes, new social perspectives, and changes in elk populations.

Data analysis units are composed of game management units (GMUs), (table MIS-17). GMUs are used to implement harvest objectives defined in a specific DAU. Land status and management can be composed of private, federal, corporate, and state lands, with percentages of each varying by area. In some cases, land status may overlap DAU and GMU boundaries. The White River National Forest contains portions of the following elk DAUs: E6, E12, E13, E14, E15, and E16, located in the northwestern part of Colorado covering 10,873 square miles (figure MIS-1). Approximately 3,853 square miles (35 percent) of these DAUs are found within the proclaimed boundary of the White River National Forest. Table MIS-18 displays the land ownership status of the DAUs found on the White River National Forest. The total populations, cow/calf ratios, and harvest figures presented below include data covering the entire DAUs mentioned. However, for the purposes of the travel management plan, all analyses on the data for the DAUs are completed only for National Forest System lands. Data are inadequate concerning either habitat conditions or road and trail mileage or uses to include lands other than National Forest System lands in this analysis package. The factors that vary by alternative are only those that occur on National Forest System lands, that is, roads and trails under Forest Service management jurisdiction. Habitat condition descriptions and road and trail mileages used throughout this report include only National Forest System lands.

The CDOW uses several methods to determine population objectives for DAUs. Monitoring of populations may be done by one or more of the following methods: postseason aerial counts, radio telemetry, computer model simulations, density estimates, quadrate surveys, line transects, research projects, and phone or written hunter surveys (CDOW 2002). Table MIS-6 displays the population objectives and game management units within the DAUs on the White River National Forest. Table MIS-7 shows the land ownership status of DAUs on the forest.

Table MIS-6. Population objectives and population estimates for the data analysis units on the White River National Forest

DAU	Game management units	Population objective	2003 data post hunt
E6	211,11,12,13,131,231,23,24,25,26,33,34	43,000*	48,102
E12	35,36	5,000*	7,041
E13	28,37,371	3,000	4,200
E14	42,421,41,411,52,521	10,500**	11,543
E15	43,471	4,500*	4,903
E16	44,444,45,47	6,000*	5,841
Total		**72,000**	**81,630**

**Draft population objectives, in the Draft 2002 DAU Plans (CDOW Draft 2002).*

*** From 1995 final DAU plan (CDOW 1995).*

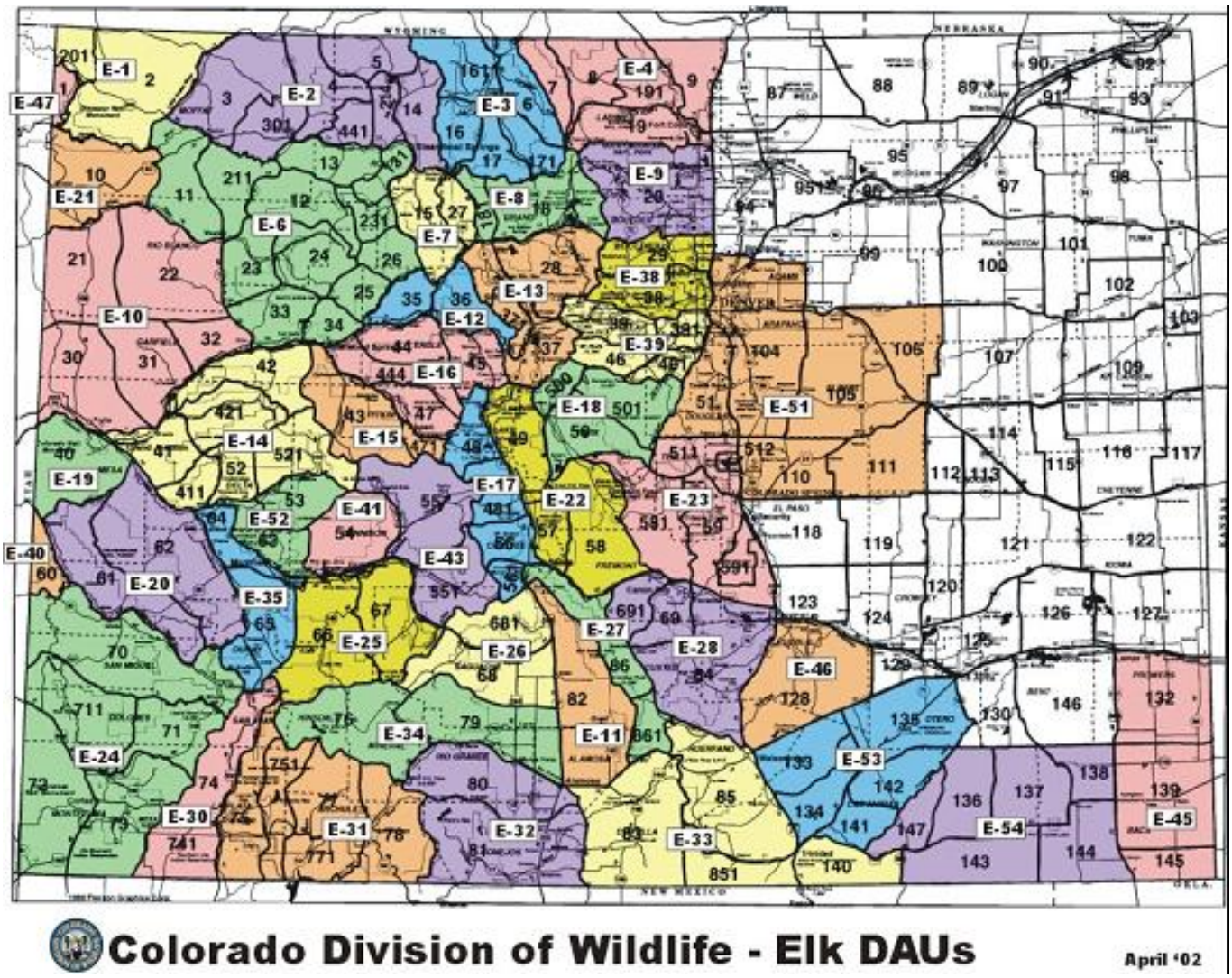

Figure MIS-1. Elk DAUs for the State of Colorado; portions of DAUs 6, 12, 13, 14, 15, and 16 overlay the White River National Forest.

Table MIS-7. Land ownership status of each DAU found on the White River National Forest in square miles and percentage of DAU on White River National Forest

DAU	White River National Forest	BLM	Private	State^	CDOW^^	Total
	square miles(%)	----------square miles----------				
E6	1,395.0 (33)	890.0	1,725	130.0	35.0	4176
E12	2,50.1 (40)	219.8	147.4	4.8	5.5	627.6
E13	479.1*(35)	70.4	402.0	10.8	4.1	1369.2
E14	197.3**(8)	464.0	930.6	27.5	0	2471.2
E15	561.0 (66)	65.0	223.0	1.0	0	851.0
E16	970.3 (70)	124.7	269.5	5.4	8.5	1378.4
Total	**3,852.8(35)**	**1833.9**	**3,697.5**	**179.5**	**53.1**	**10,873.4**

^ other than Division of Wildlife

^^ CDOW = Colorado Division of Wildlife

** An additional 392 square miles of this DAU are located on the Arapaho-Roosevelt National Forest.*

*** An additional 851.8 square miles of this DAU are located on the Grand Mesa and Gunnison National Forests.*

Today, two of the largest influences on management of elk are human population growth and land development (CDOW 2002). Both these factors influence the way the state manages these big game populations. The most influence from land development can be seen on winter range and transitional range, with some influence associated with summer range, particularly the borders of federally managed lands or development occurring on federally managed lands. The human population grows every year, which puts greater demands on habitat conditions and increases recreational activities, which in turn can influence big game population objectives.

Hunting harvest and overall elk populations are tracked by the CDOW and included in each DAU plan. Overall, elk populations and resultant hunter harvests have increased significantly across the White River National Forest over the past 50 years Elk populations within the DAUs on the White River National Forest for the past 10 years are shown in table MIS-8. Overall population and harvest levels are important considerations in the setting of hunting season framework for each portion of the state. Although methods for estimating elk numbers have changed over the past 50 years, the estimates by the CDOW represent the best population estimates for elk in the area of concern. Furthermore, despite potential problems associated with changing methods, the pattern of population increase suggested by the data is well established throughout the western United States, and empirical support for the basic pattern is strong. The CDOW uses a spreadsheet model to predict post-hunt populations (CDOW 2002).

Table MIS-9. Elk population figures for DAUs E6, 12, 13, 14, 15, and 16 from 1998 to 2007

	DAU						
	E6	E12	E13	E14	E15	E16	Total
1998	51724	6544	7933	17501	8205	10595	**102,502**
1999	54699	6530	7877	18399	8147	11221	**106,873**
2000	58579	6909	7326	17464	7928	10202	**108,407**
2001	58269	6786	8186	16866	7905	9970	**107,980**
2002	58011	6349	7429	17244	6923	9193	**105,149**
2003	62319	5687	6366	17239	5876	8895	**106,381**
2004	50206	5915	6161	17062	5960	9195	**94,498**
2005	47531	6106	5888	16706	5242	8893	**90,366**
2006	45017	4911	5822	17230	5632	8899	**87,512**
2007	43868	4762	5978	15257	5013	7696	**82,574**
10 yr ave	51724	6544	7933	17501	8205	10595	**102,502**

The following information is from the most recent forest-wide MIS analysis of elk populations, sex and age ratios, and harvest information.

Summaries

Total population

The elk herd on the White River Plateau (DAU E6) appears to be in good health at the current time. Total population, bull harvest, bull to cow ratios and calf to cow ratios are all indicative of a healthy reproducing herd. At this time, there are no identified major MIS concerns with this segment of the elk population on the White River National Forest.

The elk herds on the remainder of the forest (DAUs E12, 13, 14, 15, and 16) have all declined over the past few years towards their respective DAU population objectives. All these herds have been actively managed over the past decade to reduce populations to within the current population objectives for the current, respective DAU management plans. None of the populations are currently within the DAU objectives, but most are moving towards the objectives. Overall, the forest wide estimated elk population remained fairly stable from 1998 to 2003 when it began to decline. Between 2003 and 2007 it has declined approximately 22%. The 2007 post-hunt estimate of all DAUs on the White River National Forest are below the 10-year averages. This reduction has been planned and is moving toward meeting the DAU goals set by the DOW. Due to these active management programs aimed at reducing populations, the reductions in these herds is not, in itself, an MIS concern. **At this time, there is no MIS concern about this decline.**

Calf:cow ratios

All DAUS except DAU E6 are currently showing possible signs of reproductive stress.

Most of the herds have shown sizeable reductions in overall populations, but they have also had downward trends in the calf to cow ratios over the past several years. In a normal, healthy population, a reduction in overall population should result in an increase in the calf to cow ratio as a positive reproductive response to the reduced population. A downward trend in the calf:cow ratio is normally an indication of some type of stress within the herd that is resulting in a downward trend in calf recruitment and/or survival. All of these herds currently have calf to cow ratios below 50:100, some lower than 40:100. Any figure below 50:100 is a concern as an indicator of possible reproductive

stress. These depressed calf:cow ratios are a concern to both the DOW and an MIS concern to the White River National Forest. Several potential factors may be contributing to this downward trend. They include:

1. Some of this decline may be a stress response of the population to being over the DAU population objective for the herd. The population may currently exceed the long-term carrying capacity of the habitat.
2. Long term severe drought throughout the Western United States, including Colorado. This drought has had effects on the production and nutritional values of the forage on all seasonal ranges for all wildlife species on the White River National Forest.
3. Continued development of private lands into home sites, businesses, and other developments. Much of this development has occurred within elk winter range and severe winter range. In most DAUs the majority of the winter range is found on private lands in the valley bottoms. Summer range is not generally felt to be a limiting factor for these herds.
4. Increased recreation use of public lands. Over the past 10 years there has not been a significant increase in motorized system roads or trails anywhere on the White River National Forest. Some new "user-created" roads and trails have occurred and use on these is not well-regulated at this time. The Forest is the most-visited National Forest in the United States with over 9.6 million visitors annually. If you subtract the 7.1 million skiers visiting resorts, the forest is ranked number 8 nationally with over 2.5 million visitors. This use continues to increase annually with increases in backcountry use potentially stressing elk. Not all impacts to elk occur from motorized uses. The increases in non-motorized human uses on the forest are also likely stressing elk on many of their seasonal ranges experiencing this increase in backcountry use by humans.
5. Gas development in the northern portion of DAU E14- The large scale of the gas field development in this part of the state has affected large areas of winter range, primarily at this time on BLM and private lands. These areas historically had low disturbances during the winter, but gas field development and maintenance activities now occur year-round.
6. Mountain pine beetle outbreak on the eastern half of the Forest. The impacts of this extensive mountain pine beetle epidemic are unknown at this time, but effects to elk habitat are possible.

The bull:cow ratios and the overall bull elk harvest have been fairly stable or increasing in these DAUS over the past 10 years. Neither of these parameters is of MIS concern at this time. Even in light of recent high cow harvest, the overall herd productivity is sufficiently recruiting new bulls into the population at a rate great enough to maintain long-term bull harvest in most DAUs.

Seasonal Evaluations for Elk

Summer

Topography, elevation, weather, livestock grazing, travel management, soil types, and plant communities are the main factors influencing habitat condition and capability. Elk are migratory, moving between winter and summer range throughout the year. Winter range is the most critical for this species on the White River National Forest, mainly

influenced by weather, forage, and body condition. Summer range can be critical if there is a very dry summer thereby decreasing forage amount and condition. Actions proposed under the travel management plan are not expected to result in direct changes to elk habitat on the forest because no new roads or trails would be constructed under any of the alternatives.

Winter

The analysis for winter travel management impacts on elk focused on the changes in use associated with the two major management areas identified in the forest plan that are managed as elk winter range (5.41, deer and elk winter range, and a subset of 5.43, elk habitat identified as having winter range values) (table MIS-9). Motorized and non-motorized recreation use of the portions of the forest supporting deep snow should have limited impacts on wintering elk since elk will not be in those areas during the heavy snow periods.

Table MIS-9. Winter travelway acres by alternative for lands within management area 5.41 and those portions of Management Area 5.43 identified as elk winter range on the White River National Forest

Type of use	Alternative A	Alternative F	Alternative G
Winter open motorized (acres)	266,228	266,228	240,262
Winter restricted motorized (miles)	113,153	113,153	139,118
Winter Motorized Prohibited	216,742	216,742	216,742

953 square miles of potential habitat were analyzed.

Alternative F and A allow identical authorized uses. Alternative G increases winter restricted uses and decreases winter open use areas.

Effects on Habitat from the Travel Management Plan for Elk

Direct and Indirect Effects on Elk Habitat

All alternatives. There would be no new road or trail construction under any alternatives proposed in this document (table MIS-10). The footprints of all roads and trails already exist on the ground. The type of use may change for various roads and trails by alternative, but ground-disturbing impacts from all alternatives would be limited to minor maintenance, the result of the actual use of the travelway, or the decommissioning of roads or trails. No direct modification of elk habitat would result from road or trail construction from any alternative. Elk use of potential habitat would result from the suitability of the habitat coupled with human use of the roads and trails across the forest. Some changes to elk use of suitable habitats would occur as human uses change from one category of use to another in various alternatives. Road and trail decommissioning under all alternatives should lead to reduced access resulting in minor long-term beneficial effects for disturbance impacted species on the forest. Any such increase is not expected to be measurable.

Table MIS-10. Travelway densities by alternative for the entire White River National Forest

Type of use	Density (miles per square mile)		
	Alternative A	Alternative F	Alternative G
Motorized	0.56	0.56	0.50
Mechanized	0.20	0.20	0.16
Motorized/mechanized	0.76	0.76	0.66
Foot/horse	0.36	0.36	0.39
Total	1.13	1.13	1.05
Scheduled for decommission (reduction in density)	0.00	0.25	0.32

Approximately 3574 square miles of potential habitat were analyzed for this species.

An analysis was completed to determine the number of blocks and acres of security blocks available for elk across the White River National Forest. Security blocks were defined as blocks of contiguous forested habitat greater than 250 acres and more than ½ mile from any road or trail open to motorized travel.

Table MIS-11. Summary of summer travel management by miles on the White River National Forest

Legend	Alternative A	Alternative F	Alternative G
Licensed Motorized Only	15	15	585
Licensed and Unlicensed Allowed	1724	1724	850
Motorized vehicles < 50” in width	109	109	143
Motorized two-wheeled vehicles	43	43	67
Mechanized (bicycles)	740	737	596
Foot and Horse (pack animal)	1339	1344	1440
Managed under special use permit	126	125	212
Closed to the public but remain on the system	60	59	32
Closed to the public but not decommissioned or rehabilitated	1252	0	0
Closed to the public and to be /or all ready decommissioned/rehabilitated	0	1252	1483
Total	5408	5408	5408

Table MIS-12. Security blocks on the White River National Forest

	Alternative A	Alternative F	Alternative G
Number of security blocks	105	105	98
Acres of security blocks	1,427,259	1,427,259	1,498,622
% of forest in security blocks	62%	62%	66%

Alternative A. Existing system roads and trails would continue to be used with the exception that within management areas that have road or trail density restrictions, some roads and trails have been identified for closure to assure compliance with forest plan direction. No unauthorized roads or trails would be added under this alternative, but these routes would not be scheduled for decommissioning in this alternative (except for routes already covered for decommissioning under existing NEPA). Table MIS-11 displays the number of roads and trails open to various uses under this alternative. Table MIS-12

displays the number of security blocks across the forest under each alternative. There would be a total of 204 blocks of security habitat that total over 1.4 million acres (62 percent of the forest) under Alternative A.

Alternative F. Alternative F is the minimal action alternative which makes Alternative A compliant with the Forest Plan direction and all applicable laws and regulations. Under this alternative all user-created routes are rehabilitated. No routes are adopted. No system routes are decommissioned. Tables MIS-11 and MIS-12 display the number of miles of roads and trails and the number of blocks of security habitat that would be open under this alternative. Although there are fewer numbers of blocks, the total acreage is the same as under alterative A indicating that at least some of the blocks are larger.

Alternative G. Alternative G is the preferred alternative and was designed by looking at the DEIS, public input, and implementation of the travel rule. This alternative also looks at which routes should be part of the system and which should be decommissioned or rehabilitated. This alternative has the greatest amount of security blocks.

Habitat effectiveness for elk would be increased slightly in DAU E12 and DAU E16 under this action alternative. Tables MIS-11 and MIS-12 display the expected number of road and trail miles and the number of security blocks that would result from the implementation of this alternative. No new roads or trails would be constructed under this alternative; however, some existing unauthorized routes would be added to the system. Many of these unauthorized travelways would be open to motorized uses but would be managed as local roads. This alternative results in the fewest number of system miles open to motorized and mechanized uses across the forest. Foot and horse routes are increased slightly across the Forest, but this is not expected to result in significant impacts to elk. Foot and horse use is already allowed across the Forest and this action would merely standardize routes already being used. Although there are fewer total blocks of security habitat, there are aver 70,000 more acres included in the blocks that are on the forest indicating larger blocks of secure areas.

Cumulative Effects for Elk

Oil and gas development, ski area expansions, vegetation management (including timber sales and prescribed fire), and grazing are all expected to continue on the White River National Forest. It is not possible to quantify the quantity, duration, or locations of these individual activities; however, they all have the potential to affect the way elk use the habitats on the forest. Private lands adjacent to the forest are expected to continue to be developed into homesites and other developments, which will affect elk most significantly in relation to the availability of winter range.

Suitable Habitat and Habitat Capability for Elk

Most of the White River National Forest is considered to be suitable habitat for elk for one or more seasons of use. Roads and other human developments reduce the habitat capability of the areas adjacent to these developments. There would be no direct habitat negative developments or changes to elk habitat associated with any of the alternatives associated with the travel management plan. Some long-term restoration of habitat would occur as roads are decommissioned and return to native vegetation. Changes to the habitat capability are a result of various levels of open motorized travelways in each alternative.

Effects on Elk Population Numbers as a Result of the Travel Management Plan

No impacts on the overall population are expected to occur because of changes in habitat under any of the alternatives. Elk response to any increase in motorized travel on the roads and trails open to use may increase the early fall migration of elk from public lands onto adjacent private lands without an overall effect to the population. As elk on private land are often not as available for harvest during the hunting season, higher levels of motorized use on the forest have the potential to result in an overall increase in the elk populations plus a corresponding decrease in the harvest. Road closure improves the security habitat for elk and has the potential to increase population numbers. This increase could be offset by increased hunter success resulting from the provision of secure elk habitat on National Forest System land, leading to more harvest on populations on public lands.

Forest Plan Management Indicator Species Objective for Elk

Manage motorized and non-motorized travel and recreation management to maintain effective use of habitat by large wild ungulates (USDA Forest Service/White River National Forest 2002a).

All action alternatives of the travel management plan meet this objective. Analysis at the DAU and the forest-wide levels indicate that habitat effectiveness would be maintained or improved under all alternatives. For the summer season, alternative A and F would maintain habitat, while alternative G would slightly increase effectiveness. This alternative is not expected to result in population increases that can be effectively measured or tied directly to the impacts of the proposed action, at either the DAU or forest level. None of the alternatives will affect the viability of elk on the White River National Forest.

Monitoring

Monitoring for elk as a management indicator species at the forest level is detailed in the 2005 White River National Forest MIS Elk Monitoring Protocol (USDA Forest Service/White River National Forest 2005) and the 5 year results (2003-2007) are detailed above. This monitoring protocol will continue to be implemented on the White River National Forest.

Cumulative Impacts for all MIS Terrestrial Vertebrate Species

The following assessment is applies to all terrestrial vertebrate management indicator species discussed in this report. The cumulative impacts assessment for this project includes those actions expected to occur on National Forest System lands of the White River National Forest over the next 5 to 10 years. General recreation use is expected to increase across the forest. Projections on future uses were documented in the forest plan environmental impact statement (USDA Forest Service/White River National Forest 2002b). Much of this recreation use will be centered around the access provided by existing roads and trails on the forest. Management of domestic livestock is expected to continue across the forest at levels similar to those found today. Oil and gas exploration is forecasted to increase in those portions of the forest that are authorized and available for those activities. Private lands within and adjacent to the forest will likely continue to see residential and associated business development. This development is expected to result in a slight increase in the overall density of roads and trails to access private lands parcels surrounded by National Forest System lands. Ski area expansions and vegetation

management (including timber sales and prescribed fire) are all expected to continue on the White River National Forest. It is not possible to quantify the quantity, duration, or locations of these individual activities; however, they all have the potential to affect the way various wildlife species use the habitats on the forest.

This environmental impact statement covers all National Forest System lands within the proclaimed boundary of the White River National Forest. As such, it does not cover any changes in the travel management options or other activities on private lands within the proclaimed national forest boundary for either state or private lands. At the scale of this document it is impossible to identify site-specific actions on either private or state lands that may affect listed species.

The majority of the state lands included with the proclaimed national forest boundary or immediately adjacent to the forest will continue to be managed very similarly to the current situation. Use is limited in scope and duration on state lands because most of these lands are either state parks that are managed to provide recreational opportunities for a wide range of users (Rifle Gap, Harvey Gap, and Sylvan Lake State Recreation Areas) or state wildlife management areas that are managed specifically for the benefit of wildlife and recreation (Christine, Toner Creek, Garfield Creek, Jenson, Coke Oven, and Radium State Wildlife Areas). No new major developments are expected to occur on these areas.

Private lands within the proclaimed boundary are expected to continue to be developed as private home sites and housing developments under county planning regulations. Many of these developments will take place within or adjacent to suitable sensitive and general species habitats. Urbanization brings with it a change of the landscape, more people, domestic animals, all contributing to a change of natural settings and fragmentation of habitat.

Aquatic MIS

Macroinvertebrate Communities

Aquatic macroinvertebrates are those invertebrates that spend at least part of their life cycle in water. These include worms, mollusks, mites, and insects. Insects are by far the most common. Most insect species spend just the immature phase (larval or nymph phase) in water. Although sensitive species occur in most insect orders, three orders are comprised primarily of species that are more sensitive to disturbance. These are Ephemeroptera (mayflies), Plecoptera (stoneflies), and Tricoptera (caddisflies). In this document, “EPT taxa richness” refers to the number of taxa in these three sensitive orders. Additionally, a White River National Forest specific metric was developed identifying local taxa sensitive to sediment.

Distribution and Abundance

Macroinvertebrate communities occur in all water bodies on the White River National Forest, including ponds, lakes, reservoirs, wetlands, rivers, perennial streams, and intermittent streams. Even degraded systems usually contain aquatic macroinvertebrates, however these communities look very different from those in pristine systems. On the White River National Forest, macroinvertebrate communities were selected to address trend and condition of flowing waters only and, therefore, macroinvertebrate communities in still water habitats will not be discussed further in this document. Because of their wide distribution and their sensitivity to disturbance and pollutants, macroinvertebrates are widely used to monitor the health of streams and rivers.

Habitat Associations

Macroinvertebrate communities are influenced by the timing of flow and water quality in the streams in which they live. Geology, elevation, temperature, gradient, and substrate distribution are other factors that commonly influence macroinvertebrate communities. As habitats are degraded, either by chemical pollutants, increased sediment, or unfavorable changes in flow (especially severe reductions), the response of the macroinvertebrate community is typically a reduction in the number of species which occur there and especially the number of sensitive species.

Forest Plan goal, Objectives, Standards, and Guidelines for Macroinvertebrate Communities, Fish, and Stream Health

Goal 1 Ecosystem Health: Promote ecosystem health and conservation using a collaborative approach to sustain the nation's forests, grasslands, and watersheds.

Objective 1a: Improve and protect watershed conditions to provide the water quality and quantity and soil productivity necessary to support ecological functions and intended beneficial uses.

Objective 1: Provide ecological conditions to sustain viable populations of native and desired nonnative species and to achieve objectives for Management Indicator Species (MIS) and focal species.

MIS Objective for Macroinvertebrate Communities: Conduct forest management to maintain or improve water quality (including chemical aspects as well as sediment) such that aquatic faunal communities are similar between managed and unmanaged streams.

Strategy 1b.4: Within 15 years, demonstrate positive trends in habitat availability, habitat quality, or other factors affecting sensitive species and Management Indicator Species.

Water and Riparian Resources Standards:

- In each stream capable of supporting a self-sustaining fishery, ensure that projects maintain sufficient habitat, including flow, for all life history stages of native and desired non-native aquatic species.
- In the water influence zone next to perennial and intermittent streams, lakes, and wetlands, allow only those actions that maintain or improve long-term stream health and riparian ecosystem condition.
- Design and construct all stream crossings and other instream structures to provide for passage of flow and sediment, withstand expected flood flows, and allow free movement of resident aquatic life.
- Conduct actions so that stream pattern, geometry, and habitats are maintained or improved toward robust stream health.

Population Trends for Macroinvertebrates

Forest-wide Trend Sampling

Macroinvertebrates were selected as a management indicator species during the 2002 forest plan revision and amendment. A sampling design was developed to select stratified random samples from across various types of management and livestock grazing types across the forest. Level of management was based on the forest plan management area prescriptions. Management area prescriptions are divided into 4 groups – all 1's and 2's

were combined (called “MA-1” in the table below), 3’s and 4’s were combined (“MA-3”), 5’s were combined (“MA-5”), and 7’s and 8’s were combined (“MA-7”). Since livestock is largely independent of management area prescription and can have significant effects to aquatic resources, the type of livestock grazing was also considered and each of the four categories of management area prescriptions were divided into cattle grazing, sheep grazing, and no grazing to form 12 categories. Since very few areas fell into the management area prescription category with 7’s and 8’s, all grazing types were combined into one category, reducing the total number of categories to 10 (e.g., “MA-1 Cattle” or “MA-1 C” in the tables below). Both common trout and aquatic macroinvertebrate communities were sampled from each site.

Five watersheds were randomly selected from each of the 10 management categories, with one site from each of the 10 management categories sampled each year over 5 years starting in 2003 with the rotation starting again in 2008. As such, in general, sites have each been sampled once to establish a baseline, but no repeat sampling has occurred. There are a few exceptions where a site was dropped for a variety of reasons (i.e. there were no fish present at the site, the stream or river was too large or swift to be safely and effectively sampled with our equipment, or grazing had been discontinued at a site selected to monitor grazing). Most of the sites that were dropped for any of the reasons mentioned above have been replaced and baseline sampling has occurred, but there are a few exceptions. Table 1a displays the results of baseline survey for Aquatic MIS, including fish, which are discussed later in this document. In addition, some sites have had macroinvertebrates sampled more than once (Table 1b). This is the case where these sites were needed to serve as Reference Sites for other projects across the forest and therefore tend to be sites within designated wilderness areas. These sites were not randomly selected for repeat sampling (therefore they are not representative) and were usually chosen to provide “reference” site data for analysis for various projects across the forest. Although there is not sufficient data to determine trends, in general sites seemed to support a more diverse community in later sampling.

Table MIS-13. Aquatic MIS sampling partial baseline results collected between 2003 and 2007

Site	Mgmt area	Date	Grad.	Alk.	Elevation	Width	% Fines	res.pool Depth	#EPT	Sed. sens.	Trout	Other sp
Big Fish Creek	MA1-C	08/29/03	2.5	92	8800	8.0	12	na	23	9	81	sculpin
*Campbell Creek	MA1-C	08/30/05	8.5	na	8799	1.8	31.6	0.14	14	4	none	none
Capitol Creek	MA1-C	08/18/06	1.6	150	9075	6.6	8.2	0.35	18	5	54	none
Ripple Creek	MA1-C	08/12/04	2.4	104	8920	3.4	9	0.32	21	7	45	none
*Ute Creek	MA1-C	08/22/07	2.4	--	8973	--	--	--	16	6	none	none
Avalanche Creek	MA1-no	09/03/03	3	102	8748	10.1	11.8	0.2	18	8	31	sculpin
*Black Creek	MA1-no	08/09/07	--	--	9062	--	--	--	13	6	na	na
East Maroon Creek	MA1-no	08/16/06	0.9	80	9399	7.2	3.9	0.48	16	6	79	none
Snowmass Creek	MA1-no	09/08/04	2	85	8874	6.7	6.3	0.66	17	6	79	none
Upper Fryingpan	MA1-no	08/18/05	2	44	10058				19	8	76	none
East Fork Crystal River	MA1-S	08/26/04	2.9	154	10511	4.4	6.1	0.19	18	6	1	none
Meadow Creek	MA1-S	09/26/05	7.6	76	8533	4	10.7	0.24	24	10	40	sculpin
North Fork Piney River	MA1-S	09/12/06	5	160	8030	3.6	10.6	0.26	24	11	45	sculpin
Piney River	MA1-S	09/11/03	4	32	9759	6.2	4	0.57	21	7	24	none
South Fork White River	MA1-S	8/14,15/07	0.9	76	9117	10.7	3.2	na	18	5	75	none
*Beaver Creek	MA3-C	08/04/04	2.5	130	9606	1.9	68.3	0.2	7	1	9	none
*Cache Creek	MA3-C	08/09/06	7	380	9869	2.5	10.8	0.34	14	4	none	none
Cottonwood Creek	MA3-C	09/02/03	4.7	200	7950	1.1	37	0.12	17	6	3	none
East Brush Creek	MA3-C	08/31/05	3.6	90	9423	4.1	6.4	0.27	20	8	52	none
Gypsum Creek	MA3-C	8/15,16/07	5.7	120	8602	3.7	25.5	0.22	16	8	31	none
Snell Creek	MA3-C	08/21/07	6.2	144	8386	4.3	3.4	0.31	22	8	14	sculpin
Chapman Gulch	MA3-no	08/27/07	0.8	60	8596	4.5	13.4	0.45	25	8	60	sculpin
Crystal Creek	MA3-no	09/08/03	8.4	na	10513	2.3	21.7	0.28	21	8	5	none
Express Creek	MA3-no	07/15/04	na	53	10773	1.5	19	0.45	9	1	4	none
McCullough Gulch	MA3-no	08/07/07	2.9	32	11329	4.2	8.7	0.42	13	3	none	none
South Fork Fryingpan	MA3-no	08/17/05	3	68	9488	8.0			11	5	128	none
Buck Creek	MA3-S	09/09/03	3	174	9960	2.5	4	0.24	16	6	77	none
Deep Creek (Eagle RD)	MA3-S	08/29/06	3	128	10597	3.6	4.8	0.25	20	6	136	sucker
East Fork Fawn Creek	MA3-S	08/20/07	7.4	320	7842	2.7	13.3	0.31	19	8	104	none

Site	Mgmt area	Date	Grad.	Alk.	Elevation	Width	% Fines	res.pool Depth	#EPT	Sed. sens.	Trout	Other sp
Milk Creek	MA3-S	08/15/05	3	164	8048	3.5	15.9	0.17	11	3	5	none
Morapos Creek	MA3-S	08/10/04	2.7	236	8150	2.5	15.3	0.28	20	3	36	sculpin dace
Cattle Creek	MA5-C	08/10/06	3	200	8562	3.7	25.9	0.35	19	8	75	sculpin
Derby Creek	MA5-C	09/29/05	2	156	7875	6.7	9.8	0.4	19	5	31	none
East Elk Creek	MA5-C	08/02/05	3.4	120	6450	7.5	6.7	0.21	19	6	28	sculpin
East Miller Creek	MA5-C	08/26/03	1	140	7198	4.7	22.5	0.29	10	5	14	sculpin
*Fourmile Creek	MA5-C	09/01/04	1.7	250	9040	2.4	45.7	0.2	na	na	none	sculpin
Middle Thompson Creek	MA5-C	08/29/07	na	168	7410	na	7.8	na	21	8	40	sculpin
Bennett Gulch	MA5-no	09/04/03	4.97	43	9908	1.5	22.2	0.14	20	7	26	none
*Miller Creek	MA5-no	08/03/06	4	80	8580	1.6	6.9	0.22	9	4	none	none
Miners Creek	MA5-no	08/06/07	3.7	20	9462	3.4	17.4	0.22	20	8	54	none
North Barton Gulch	MA5-no	07/22/04	5.1	44	10000	1.1	30.7	0.21	16	8	2	none
South Fork Swan	MA5-no	08/17/05	6.1	60	10020	2.4	6.1	0.17	21	8	23	none
West Grouse Creek	MA5-no	08/01/07	7.5	44	9397	3.2	10.4	0.22	17	7	47	none
Deep Creek (Rifle RD)	MA5-S	08/18/04	3.3	168	8905	2.2	22.5	0.17	12	4	45	none
East Canyon Creek	MA5-S	9/4, 10/2/03	2.4	174	9976	2.5	12.8	0.29	15	5	14	none
Resolution Creek	MA5-S	08/15/06	3.6	180	9595	2.8	20.3	0.24	21	9	42	none
Three Forks Creek	MA5-S	08/02/07	2	232	7581	3.9	na	0.48	7	1	29	none
Turkey Creek	MA5-S	09/01/05	5.8	200	9196	4.6	8.7	0.19	22	9	26	none
Castle Creek	MA7	08/28/07	1.5	188	8828	7.4	2.4	0.24	20	7	34	sculpin
Keystone Gulch	MA7	08/08/06	4.8	68	9992	3.0	7.8	0.27	18	8	40	none
Two Elk Creek	MA7	08/05/04	7.6	170	9220	3.2	26	0.32	17	6	28	none
West Tenmile Creek	MA7	08/23/05	2.5	112	9997	5.9	3.2	0.16	15	6	71	sculpin

**these sites have or will be replaced and will not be continued. In some cases, physical data was not collected at these sites.*

Table column definitions:
***Mgmt area**: code for which management area this site represents MA is the level of activity, C = cattle grazing, "no" = no livestock grazing, and "S" = sheep grazing.*
***Date** = date sampled*
***grad**. = reach gradient*
***alk**. = total alkalinity in ppm*
***elevation** = elevation at bottom of the reach*
***width** = average wetted width of sampled reach*
***% fines** = % of particles less than 6mm from Wolman pebble count*
***res.pool depth** = average residual pool depth*
***#EPT** = the number of Ephemeroptera, Plecoptera, and Trichoptera taxa collected during macroinvertebrate sampling*
***sed.sens.** = A WRNF specific metric of sediment sensitive macroinvertebrate taxa collected*
***Trout** = population of trout captured in the sampled reach based on a multiple pass depletion estimate (excludes young-of-year)*
***Other sp.** = other species of fish also present*

Table MIS-14. Two key macroinvertebrate metrics from the eight sites that were sampled more than once

Site (management code)	Metric	2003	2004	2005	2006	2007
Avalanche Creek (MA1 – no grazing)	# EPT	18		21		
	sed.sens.	8		9		
Big Fish Creek (MA1 – cattle grazing)	# EPT	23			26	18
	sed.sens.	9			9	5
East Maroon Creek (MA1 – no grazing)	# EPT				16	17
	sed.sens.				6	7
McCullough Gulch (MA3 – no grazing)	# EPT	11				13
	sed.sens.	2				3
Piney River (MA1 – sheep grazing)	# EPT		21	17		
	sed.sens.		7	6		
Ripple Creek (MA1 – cattle grazing)	# EPT		21		26	21
	sed.sens.		7		10	9
Snowmass Creek (MA1 – no grazing)	# EPT		17			23
	sed.sens.		6			7
Two Elk Creek (MA7)	# EPT		17	23		
	sed.sens.		6	9		

There is insufficient data to determine forest-wide trends, information is available, however, to discuss status and trends associated with forest management and human interaction that could affect macroinvertebrates.

Aspects that negatively impact macroinvertebrate trends include:

- Increased dispersed recreation use and increased use and expansion of developed sites such as campgrounds and ski areas is increasing sediment delivery to streams and impacting riparian vegetation.
- The recent increase in natural gas development on parts of the forest, specifically the Rifle Ranger District is potentially increasing sediment delivery to streams due to the increased level of disturbance and activity. Activity is expected on the Sopris Ranger District.
- Continued development of water for urban and other uses, including transbasin diversions, reduces instream flows.
- Urban development in communities around the White River National Forest has a suite of effects including removal of riparian vegetation, introduction of chemical contaminants, creation of barriers, and increased sediment delivery.

Aspects that positively affect macroinvertebrate trends include:

- Adoption of the Watershed Conservation Practices, including:
  - Limiting disturbance in the water influence zone
  - Improving road-stream crossings with structures that minimize stream impacts and allow aquatic organism passage
- Reduced livestock grazing on National Forest System lands as allotments are vacated primarily due to the loss of base property to development.

- Increased focus on watershed improvement with a continuing effort to find and correct existing problems from ongoing activities.
- Road improvements to disconnect disturbed areas from streams to reduce sediment input.

Recent forest management is considered to create a positive trend in macroinvertebrate communities with better protections in place and proactive projects to improve damaged areas. Growth outside the forest boundary and other aspects over which the forest has little control like water development and natural gas development are likely to be contributing to a negative trend in localized areas. At this time, it is not possible to determine which direction the forest on average is trending. Protocols are in place and monitoring has begun to determine trends.

Effects on Habitat from the Travel Management Plan

Direct and Indirect Effects on Habitat

For this analysis, No Action is considered the baseline and effects are described as increases or decreases from this baseline for various indicators. It is assumed for this analysis that when a road is closed it is closed effectively such that it ceases to have impacts on the aquatic system. Seventh level Hydrologic Unit Codes (HUCs) were used for this analysis and are referred to here as "catchments." There are 388 catchments wholly or partially on the White River National Forest.

The effects of roads on aquatic organisms are well documented. A synthesis of road impact information can be found in "Forest Roads: A synthesis of scientific information" (USDA 2000). Some of the key findings from this document relating to travel management include both physical and biological effects are quoted below.

Physical Effects

- "Roads affect geomorphic process by four primary mechanisms: Accelerating erosion from the road surface and prism itself by both mass and surface erosion processes; directly affecting channel structure and geometry; altering surface flowpaths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and woody debris at engineered road-stream crossings."
- "Roads have three primary effects on water: they intercept rainfall directly on the road surface and road cutbanks and intercept subsurface water moving down the hillslope; they concentrate flow, either on the surface or in an adjacent ditch or channel; and they divert or reroute water from flowpaths that it would otherwise take if the road were not present."

These physical effects lead to the following biological effects:

- "Increased fine-sediment composition in stream gravel has been linked to decreased fry emergence, decreased juvenile densities, loss of winter carrying capacity, and increased predation of fishes."
- "The effects of roads are not limited to those associated with increases in fine-sediment delivery to streams; they can include barriers to migration, water temperature changes, and alterations to streamflow regimes."
- "Road stream-crossings have been shown to have effects on stream invertebrates. Hawkins and others found that the aquatic invertebrate species assemblages (observed versus expected based on reference sites) were related to the number of stream crossings above a site."

- "Several studies at broad scales document aquatic habitat or fish density changes associated with road density or indices of road density."

Effects of the travel management plan were determined by analyzing three indicators: total road miles or road density by subwatershed, total road miles within 300 feet of streams or rivers by subwatershed, and number of road crossings by subwatershed. Only roads were selected for this analysis because, in general, they have greater impacts on aquatic systems than do trails because of their larger size and level of disturbance. Winter use was not analyzed because there is no associated ground disturbance.

Comparison of Alternatives

Direct and Indirect Effects

Alternative A-no action is the existing classified road system, which is out of compliance with forest plan in some locations. For all indicators, alternative A had the greatest impacts. The alternative A has 271 to 560 more road miles, 98 to 188 more road miles within 300 feet of a stream or river, and 77 to 113 more perennial stream crossings than the other action alternatives. In comparison to alternatives F and G, the alternative A has the greatest impacts to macroinvertebrate communities.

Although the alternative A has more impacts than alternatives F and G forest-wide, there are some subwatersheds in which alternative A has less impact than the other alternatives. This is generally due to potential short-term impacts due to decommissioning or rehabilitation in alternative F and the same for alternative G, plus alternative G adds some roads and trails in certain subwatersheds eventhough forest-wide there is a reduction.

Road Density

Table MIS-15 displays the total number of open roads and the forest-wide road density for all alternatives. Although road density generally decreases in each alternative, in localized areas alternative G has more miles than alternative A, making this alternative more impactive in certain watersheds. The number of catchments gaining roads and the number of miles gained are presented in Table MIS-16.

Table MIS-15. Miles of road and road density by alternative

	Alternative A	Alternative F	Alternative G
Miles of road	2610	2339	2050
Avg. road density	0.73	0.65	0.57

Roads include maintenance levels 1 though 5.

Table MIS-16. The number of subwatersheds that add or close roads and the total miles added or closed per alternative compared to the Alternative A- No Action

	Alternative F	Alternative G
# of subwatersheds with roads **added**	0	15
Miles of road **added**	0 miles	20 miles
# of subwatersheds with roads **closed**	106	172
Miles of road **closed**	254 miles	523 miles

Catchments are counted only if they add or close ¼ mile or more of road.

Roads within 300 feet of streams

The closer a road is to a stream system the greater the impacts on the stream and the organisms inhabiting it. Roads directly adjacent to streams can impact streams by channelizing the stream, eliminating streamside vegetation, and introducing sediment into the stream. Road-stream crossings are addressed separately.

Table MIS-17 displays the total miles of maintenance level 1 and 2 roads, the percent of all level 1 and 2 roads, and the proportion of roads to be closed within 300 feet of streams and rivers for all alternatives. Alternative A has the greatest length of open road within 300 feet of streams and rivers, followed by alternative F. Alternative G has the least amount of road within 300 feet of streams and rivers. The percent of the road system within 300 feet of streams and rivers is consistent in all alternatives and the roads closed near streams and rivers are proportional to the overall road distribution. There are six catchments and subwatersheds with at least 5 miles of maintenance level 1 and 2 road within 300 feet of a stream in one or more alternative (Table MIS-18).

Table MIS-7. Miles of level 1 and 2 road within 300 feet of streams and rivers and the proportion of open roads and road closures within this area

	Alternative A	Alternative F	Alternative G
Miles of Level 1 & 2 road within 300' of streams	642	544	454
% of Level 1 & 2 roads within 300' of streams	33.0%	32.5%	32.6%
% of road closures within 300' of streams	n/a	36.2%	33.9%

Road closures are changes from Alternative A.

Table MIS-18. Subwatersheds on the White River National Forest with at least 5 miles of maintenance level 1 and 2 road within 300 feet of a stream or river

Watershed Name	Alternative A	Alternative F	Alternative G
Swan River	22.2	20.1	17.6
Green Mtn Reservoir Composite watershed	10.3	10.1	6.0
Straight Creek	7.7	2.7	4.5
Upper Snake	6.9	6.5	7.2
Peru Creek	6.9	5.8	6.8
Deep Creek (Blue River)	5.8	4.1	2.8

Road miles within 300 feet are presented for all alternatives.

Number of Stream Crossings

Road-stream crossings are areas where the impacts of roads are the greatest in terms of channel impacts, sediment, and potential movement barriers. Numbers of crossings presented in this section are not accurate and may be overestimated by up to 30% due to inaccuracies in our GIS data layers. Although not all of the crossings discussed in this section are true stream crossings, if a road segment comes close enough to the stream for it to be considered a crossing, it is probably an area of acute road impacts, though not necessarily a barrier. While absolute counts of stream crossings in this analysis are not reliable, the relative differences between alternatives is considered "very good" since the same line sets were used for each alternative (the difference is whether they are open or closed). Stream crossings from maintenance level 1 and 2 roads occur in 178 (of 388) catchments. Alternative F has a 16% reduction in the number of stream crossings and Alternative G has a 29% reduction in stream crossings.

Table MIS-19. The number of maintenance level 1 and 2 road crossing by type of stream for each alternative

Type of stream	Alternative A	Alternative F	Alternative G
Perennial	407	330	294
Intermittent	1012	859	722
Swale	812	675	571

Alternative F: *Direct and Indirect Effects:* Alternative F is the existing classified road system brought into compliance with forest plan. For all indicators, alternative F was less impactive than the alternative A and more impactive than alternative G. Alternative F has 271 fewer road miles than the alternative A, and 289 more road miles than Alternative G. For roads within 300 feet of a stream or river, Alternative F has 98 fewer miles than the No Action Alternative, and 90 more miles than Alternative G. Alternative F has 77 fewer perennial stream crossings than the alternative A, and 36 more perennial stream crossings than alternative G.

Alternative G (Preferred Alternative): *Direct and Indirect Effects:* For all indicators, alternative G has the least impacts. Alternative G has 289 to 560 fewer road miles, 90 to 188 fewer road miles within 300 feet of a stream or river, and 36 to 113 fewer perennial stream crossings than the other alternatives.

In comparison to the alternative A and alternative F, alternative G has the greatest potential for stream recovery and improvement in macroinvertebrate communities.

Although at the forest scale, alternative G has fewer roads and crossings than the other alternatives, this relationship varies at the subwatershed scale. There are fifteen subwatersheds in which the impacts of alternative G are greater than alternative F and the alternative A. Therefore, while in general alternative G does the most to ensure watershed health by having the least amount of roads, road crossings, and streamside roads, in these cases alternative G is more impactive than both other alternatives.

The impacts are greatest in Indiana Creek, Battlement Creek, and the Blue River at Breckenridge composite watershed, which all add over 2 miles of new road, with the Blue River at Breckenridge adding 4.6 new miles.

Cumulative Effects

Oil and gas development, ski area expansions, vegetation management (including timber sales and prescribed fire), and grazing are all expected to continue on the White River National Forest. It is not possible to quantify the quantity, duration, or locations of these individual activities; however, they all have the potential to affect water quality and quantity and therefore aquatic macroinvertebrate habitat on the forest. Private lands adjacent to the forest are expected to continue to see development into homesites along with dramatic alterations that reduce the general health of streams by reducing infiltration, channelizing streams, and introducing fertilizers, pesticides, and other chemicals.

Suitable Habitat and Habitat Capability

Oil and gas development, ski area expansions, vegetation management (including timber sales and prescribed fire especially associated with the current bark beetle epidemic), and grazing are all expected to continue on the White River National Forest. It is not possible to quantify the quantity, duration, or locations of these individual activities, but they all have the potential to impact water quality and quantity and therefore aquatic macroinvertebrate habitat on the Forest. Private lands adjacent to the Forest are expected to continue to see development into homesites and dramatic alterations that reduce the general health of streams by reducing infiltration, channelizing streams, and introducing fertilizers, pesticides, and other chemicals.

Forest Plan Management Indicator Species Objective for Macroinvertebrate Communities

The following forest plan management indicator species objective applies to aquatic macroinvertebrates:

Conduct forest management to maintain or improve water quality (including chemical aspects as well as sediment) such that aquatic faunal communities are similar between managed and unmanaged streams.

All action alternatives of the travel management plan meet this objective. All alternatives improve the current situation by removing roads that currently exist. In the years following this decision, actions will occur to that reduce the impact of these roads. Expected treatments range from allowing a road to revegetate naturally to active recontouring. Some roads will be converted to trails. It is expected that the footprint of the travelway will be reduced when roads are converted to trails.

Overall, this project is expected to improve trends in macroinvertebrates forest-wide by reducing the impacts of roads currently existing.

The magnitude of this improvement varies by alternative, with alternative F offering the least amount of improvement and alternative G offering the greatest amount of improvement to forest-wide trends.

Monitoring

Monitoring for aquatic macroinvertebrates as a management indicator species at the forest level will continue to occur following the current protocol.

All Trout

Cutthroat, rainbow, brook, brown trout, and their hybrids are included in the trout management indicator species. Because the analysis and conclusions for trout are identical to those for aquatic macroinvertebrate communities, see the preceding section for details.

Distribution and Abundance

Trout occur in most of the perennial water bodies on the White River National Forest, including streams, rivers, lakes, and reservoirs. Trout may be excluded from some areas due to chemical contamination below mines or by natural or human-caused barriers. At high elevations, trout may be absent due to water temperature. On the White River National Forest, trend and condition are monitored in streams and rivers only and, therefore, trout in still water habitats will not be discussed further in this document.

Habitat Associations

The timing of flow, water quality, and availability of various habitat features such as deep pools, cover, and spawning gravels influence trout abundance. Geology, elevation, temperature, gradient, and substrate distribution are other factors that commonly influence trout abundance. As habitats are degraded, either by chemical pollutants, increased sediment, or unfavorable changes in flow (especially severe reductions), trout typically respond with lower abundance and poor year class distribution.

Population Trends

Forest-wide Trend Sampling

All trout were selected as a management indicator species during the 2002 forest plan revision and amendment. A monitoring protocol was developed in early 2003 and data collection began during the 2003 field season. See the description for the stratified random sampling under Aquatic Macroinvertebrates above.

There is insufficient data to determine forest-wide trends, information is available, however, to discuss status and trends associated with forest management and human interaction that could affect trout populations.

Aspects that negatively impact trout population trends include:

- Increased dispersed recreation use and increased use and expansion of developed sites such as campgrounds and ski areas is increasing sediment delivery to streams and impacting riparian vegetation.
- The recent increase in natural gas development on parts of the forest, specifically the Rifle Ranger District is potentially increasing sediment delivery to streams due to the increased level of disturbance and activity. Activity is expected on the Sopris Ranger District.
- Continued development of water for urban and other uses, including transbasin diversions, reduces instream flows.
- Spread of whirling disease and other pathogens
- Increased fishing pressure as general recreation increases
- Urban development in communities around the White River National Forest has a suite of effects including removal of riparian vegetation, introduction of chemical contaminants, creation of barriers, and increased sediment delivery.

Aspects that positively affect macroinvertebrate trends include:

- Adoption of the Watershed Conservation Practices, including:
  - Limiting disturbance in the water influence zone
  - Improving road-stream crossings with structures that minimize stream impacts and allow aquatic organism passage
- Reduced livestock grazing on National Forest System lands as allotments are vacated primarily due to the loss of base property to development.
- Increased focus on watershed improvement with a continuing effort to find and correct existing problems from ongoing activities.
- Road improvements to disconnect disturbed areas from streams to reduce sediment input

Recent forest management is considered to create a positive trend in trout populations with better protections in place and proactive projects to improve damaged areas. Growth outside the forest boundary and other aspects over which the Forest has little control like water development and natural gas development are likely to be contributing to a negative trend in localized areas. At this time, it is not possible to determine which direction the Forest on average is trending. Protocols are in place and monitoring has begun to determine trends.

Other Trout Trend Data on the White River National Forest

The Colorado Division of Wildlife sampled most streams on the White River National Forest in the late 1970s to early 1980s. Unfortunately, techniques and efficiencies vary greatly from modern sampling such that comparisons of densities cannot be made. Some discussion at the local scale is possible by looking at species compositions, but no meaningful discussion can be made with this data at the forest scale, which is the scale for this project.

Effects on Trout Habitat from the Travel Management Plan

The analysis of effects on habitat from the Travel Management Plan is identical to that for Macroinvertebrate Communities. Refer to that section for discussion of direct and indirect effects on habitat and cumulative effects. One difference of note is the effect of road crossings on fish. Road crossings may create a full or partial barrier to fish movement. Eliminating road crossings has the potential to allow fish access into previously inaccessible areas and the ability to use the local habitat more effectively. Additional stream crossings would be expected to allow passage of all aquatic organisms per forest plan and direction in the Watershed Conservation Practices Handbook.

Suitable Habitat and Habitat Capability

As discussed under Macroinvertebrate Communities, there should be no loss of habitat capability or suitable habitat for trout. It is possible that more habitat will become suitable for trout if any of the road crossings eliminated in the action alternatives are currently barriers preventing access to upstream habitat.

Forest Plan Management Indicator Species Objective for Trout

The following forest plan management indicator species objective applies to trout:

- Conduct forest management to maintain or improve the physical habitat quality for salmonids in mountain streams.

All action alternatives of the travel management plan would meet this objective. All alternatives would improve the current situation by removing roads that currently exist. In the years following this decision, actions would occur to reduce the impact of these roads. Expected treatments range from allowing a road to revegetate naturally, to active recontouring. Some roads would be converted to trails. It is expected that the footprint of the travelway will be reduced when roads are converted to trails.

Overall, this project is expected to improve trends in trout density forest-wide by reducing the impacts of currently existing roads. The magnitude of this improvement varies by alternative, with Alternative F offering the least amount of improvement and Alternative G offering the greatest amount of improvement to forest-wide trends.

Monitoring

Monitoring for trout as a management indicator species at the forest level will continue to occur following the current protocol.